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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/662,091	09/12/2003	Paul N. Marshall	P-1728-1	8866

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EXAMINER	
CHU, CHRIS C	

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 03/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/662,091	MARSHALL, PAUL N.	
	Examiner	Art Unit	
	Chris C. Chu	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3, and 5 - 14* is/are rejected.

7)☒ Claim(s) *2 and 4* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/19/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

On page 8, line 13, after "Z" delete [axes] and insert --axis--.

On page 8, line 32, before "10" insert --IC package--.

Appropriate correction is required.

Claim Objections

2. Claim 5 is objected to because of the following informalities: On line 1, "the manifolds" lacks antecedent basis. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3, 5 – 7, 10 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Woodman (U. S. Pat. No. 5,016,138).

Regarding claim 1, Woodman discloses in e.g., Fig. 13 and column 9, line 66 – column 10, line 15 an integrated circuit package comprising:

- a plurality of circuitry wafers (L-1 – L-4; column 9, lines 67 – 68) each comprising a non-electrically conductive substrate (L-1 and 22; column 5, lines 1 – 4) on which is carried one or more integrated circuits (6; see Fig. 13 and column 10, lines 3 – 5) with at least one wafer configured for signal communication (pin; column 10, lines 5 – 9) outside the package (see e.g., Fig. 13); and
- a plurality of non-electrically conductive cooling plates (heat sinks 74; see Fig. 8 and column 10, lines 12 – 15) alternately layered with the circuitry wafers (see Fig. 13);
- wherein the circuitry wafers and cooling plates are layered in a first direction that defines a first axis of the package (from the L-4 to the L-1; call this direction as X-direction), and wherein signal communication (by the element pin) between circuitry wafers within the package occurs in a direction along the first axis (see e.g., Fig. 13);
- wherein the cooling plates are configured to direct heat flow in a path that is transverse to the first axis (inherently, side surfaces of the heat sinks are cooler than the center of the heat sinks by air cooling. Thus, the heat in the heat sinks flows from the center to the side surfaces of the heat sinks such as from one side of the element L-4 to the other side of the element L-4 in the Y-direction); and
- wherein at least one of power, data signal and control signal communication is supplied to the package from a direction that is transverse to both the first axis and the direction of heat flow (a direction from the element 2 to the element 6 in the Z-direction).

Regarding claim 3, Woodman discloses in e.g., Fig. 13 and column 9, line 66 – column 10, line 15 an integrated circuit package comprising:

- a plurality of circuitry wafers (L-1 – L-4; column 9, lines 67 – 68) each comprising a non-electrically conductive substrate (L-1 and 22; column 5, lines 1 – 4) on which is carried one or more integrated circuits (6; see Fig. 13 and column 10, lines 3 – 5) with at least one wafer configured for signal communication (pin; column 10, lines 5 – 9) outside the package (see e.g., Fig. 13);
- a plurality of non-electrically conductive cooling plates (heat sinks; column 10, lines 12 – 15) alternately layered with the circuitry wafers (see Fig. 13); and
- comprising circuitry wafers and cooling plates configured so that integrated circuits on at least two circuitry wafers in the package communicate with each other through an intervening cooling plate (see Fig. 13).

Regarding claim 5, Woodman discloses in e.g., Fig. 14 the manifolds (CHIP CARRIER AND PIN GRID ARRAY in e.g., Fig. 14) being configured to permit access to the side of the package for providing power and/or control signals to circuitry wafers in the package (see Fig. 14).

Regarding claim 6, Woodman discloses in e.g., Fig. 13 at least one cooling plate (74) comprising a plate signal path (pin S and G) therethrough (see e.g., Fig. 13) and wherein a first IC (2) on a circuitry wafer (the L-4) on one side of the cooling plate is positioned for signal communication (pin) through the plate signal path (see e.g., Fig. 13).

Regarding claim 7, Woodman discloses in e.g., Fig. 13 a second IC (12) on a circuitry wafer (at the L-3) on the other side of the cooling plate, positioned for signal communication (pin) with the first IC through the plate signal path (see e.g., Fig. 13).

Regarding claim 10, Woodman discloses in e.g., Fig. 13 at least one circuitry wafer (L-4) comprising a substrate (22) having a substrate signal path (pin) therethrough (see e.g., Fig. 13) and wherein a first IC is positioned on the substrate for signal communication therethrough (see e.g., Fig. 13).

Regarding claim 14, Woodman discloses in e.g., Fig. 13 the circuitry wafers (L-1 – L-4; column 9, lines 67 – 68) and cooling plates (74) being layered in a first direction along a first axis, and wherein the circuitry wafers and cooling plates are configured to permit signal communication (pin) between circuitry wafers within the package in a direction along the first axis (from the L-4 to the L-1; call this direction as X-direction);

- wherein the cooling plates (74) are configured to direct heat flow in a path that is transverse to the first axis (inherently, side surfaces of the heat sinks are cooler than the center of the heat sinks by air cooling. Thus, the heat in the heat sinks flows from the center to the side surfaces of the heat sinks such as from one side of the element L-4 to the other side of the element L-4 in the Y-direction); and
- wherein at least one of power, data signal communication and control signal communication are supplied to the package from a direction that is transverse to both the first axis and the direction of heat flow (a direction from the element 2 to the element 6 in the Z-direction).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 8, 9 and 11 – 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodman in view of Okada et al. (U. S. Pat. No. 5,955,010).

Regarding claims 8, 9 and 11 – 13, Woodman discloses in e.g., Fig. 11 the first IC (2) and the plate signal path (pin); a second IC (12) on a circuitry wafer on the other side of the cooling plate (74), positioned for signal communication with the first IC through the plate signal path (claim 9; see Fig. 13); and a second IC on a substrate positioned for signal communication with the first IC via the substrate signal path (claims 11 and 13; see Fig. 13). However, Woodman does not disclose first and second optical ICs and an optical signal path having optical signal communications. Okada et al. teaches in e.g., Fig. 1, Fig. 24, column 6, lines 59 – 66 and column 21, lines 34 – 43 first and second optical ICs (2, 409 and 410) and an optical signal path (3a and 403) having optical signal communications (column 6, lines 62 – 66). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodman by using the optical ICs and an optical signal path that has optical signal communications of Okada et al. into the wafer of Woodman as taught by Okada et al. The ordinary artisan would have been motivated to modify Woodman in the manner described above for at least the purpose of providing a highly reliable optical transmission line to prevent generation of breakdown or existence of the shearing stress (column 2, lines 3 – 11).

Allowable Subject Matter

7. Claims 2 and 4 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 2 and 4 contain allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of cooling plates that define flow conduits therethrough for coolant fluid, wherein each flow conduit has two conduit ends and wherein the conduit ends are aligned at two different positions on the side of the package, and wherein the package further comprises manifolds that provide a port through which to provide coolant fluid to a plurality of flow conduits and a port to collect cooling fluid from a plurality of flow conduits, and wherein the manifolds are configured to permit access to the side of the package for providing at least one of power, data signal and control signal communication to circuitry wafers in the package.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Glascock, II et al. and Davis et al. disclose wafers between heat sinks. Yamaguchi et al., Deguchi et al., Coronel et al., Cloud et al., Gilmour et al., and Bastek et al. disclose a semiconductor package formed by alternately stacking wafers and heat-radiating elements.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 517-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu
Examiner
Art Unit 2815

c.c.
Wednesday, February 16, 2005

GEORGE ECKERT
PRIMARY EXAMINER